

IN THE CLAIMS

1. (Original) An apparatus comprising:

an electronics chip having a substrate with a first face thereof having circuitry thereon, and an opposite second face; and
one or more electro-osmotic pumps in a layer over the second face.

2. (Original) The apparatus of claim 1, wherein the electro-osmotic pumps include capillary pump channels in a further layer over the second face of the electronics chip.

3. (Original) The apparatus of claim 2, wherein cooling channels are formed in a further layer over the second face of the electronics chip in fluid communication with the electro-osmotic pumps.

4. (Original) The apparatus of claim 3, wherein external fluid connections to the pumps are made at lateral edges of the apparatus.

5. (Original) The apparatus of claim 1, wherein electrical power for the electro-osmotic pumps is conducted by electrical conductors formed through the electronics chip.

6. (Original) The apparatus of claim 2, wherein cooling channels are formed in a further layer of material over the second face of the electronics chip, and the electro-osmotic pumps are in fluid communication with the cooling channels.

7. (Original) The apparatus of claim 6, wherein external fluid connections to the pumps are made at lateral edges of the apparatus.

8. (Original) The apparatus of claim 6, wherein electrical power for the electro-osmotic pumps

is conducted by electrical conductors through the electronics chip to the pumps.

9. (Original) The apparatus of claim 1, wherein the cooling channels are formed in the same layer as the capillary pump channels.

10. (Original) The apparatus of claim 1, wherein the electronics chip is silicon, cooling channels are formed in a layer of silicon over the second face of the electronics chip, and the electro-osmotic pumps are formed in a further layer of silicon over the second face of the silicon chip in fluid communication with the cooling channels.

11. (Original) The apparatus of claim 10, wherein external fluid connections are made at lateral edges of the apparatus.

12. (Original) The apparatus of claim 10, wherein electrical power for the electro-osmotic pumps is conducted by electrical conductors formed through the electronics chip.

13. (Original) The apparatus of claim 1, wherein the chip is made of silicon, and the electro-osmotic pumps include capillary pump channels formed in a layer of silicon over the second face of the chip.

14. (Original) The apparatus of claim 1, wherein the chip includes circuitry for at least a portion of a processor, the apparatus further comprising:

- a memory operatively coupled to the processor;
- an input/output system, including a display unit, operatively coupled to the processor; and
- a power supply operatively coupled to the processor.

15. (Original) The apparatus of claim 1, wherein the chip includes circuitry for at least a portion of a telecommunications circuit, the apparatus further comprising:

- an antenna operatively coupled to the telecommunications circuit;

an input/output system, including a display unit, operatively coupled to the telecommunications circuit; and

a power supply operatively coupled to the telecommunications circuit.

16. - 25. (Canceled)

26. (Original) An apparatus comprising:

an electronics chip; and

an electro-osmotic pump for circulating cooling fluid through cooling channels adjacent a face of the chip.

27. (Original) The apparatus of claim 26, wherein the electro-osmotic pump and the cooling channel are in separate layers of material attached to the face of the chip..

28. (Original) The apparatus of claim 27, wherein the electro-osmotic pump and the cooling channel are in the same layer of material.

29. (Original) The apparatus of claim 28, wherein the electro-osmotic pumping means and the cooling channel are in substantially the same plane.